POPULATION DYNAMICS OF KEY RAPTOR SPECIES

IN THE KEVIN RIM RAPTOR STUDY AREA, 1999

Challenge Cost Share Progress Report to:

Bureau of Land Management

Great Falls District

Al Harmata, Chad Olson, and Hans Gabler

Department of Biology

Fish & Wildlife Program

Montana State University

Bozeman 59717

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ABSTRACT

Aspects of population dynamics of Ferruginous Hawks (*Buteo regalis*), Prairie Falcons (*Falco mexicanus*), and Golden Eagles (*Aquila chrysaetos*) have been monitored in the Primary Study Area (PSA) of the Kevin Rim Raptor Study Area (KRRSA) in northern Toole County, Montana, since 1988. The KRRSA was expanded in 1997 to include additional portions of the Kevin Rim escarpment and tablelands (Flats) to the east. Survey efforts in 1999 were conducted during 3 phases consistent with local raptor nesting phenology. Eighteen Ferruginous Hawk, ,â•9 Prairie Falcon, and 4 Golden Eagle breeding areas were successful. Proportion of occupied Ferruginous Hawk breeding areas on the Kevin Rim escarpment that were successful was not different from those on the Flats but number of young produced per occupied breeding area was higher on the Flats than on the escarpment ($P < 0.05$). Success rate of Ferruginous Hawks breeding on private land in PSA was not different from those breeding on public land in PSA but number of young produced per successful breeding area was higher on private land than on public land ($P = 0.014$). Success rate of 10 occupied nests that were subjectively classified as inaccessible to mammalian predators was higher than nests classified as accessible ($P = 0.054$). Number of successful Ferruginous Hawk nests in the PSA declined over a 12 years of study ($P = 0.002$). Coincident decline in number of young produced in the PSA was evident but not significant ($P = 0.48$). Decline in number of occupied Ferruginous Hawk nests in PSA over 12 years was nearly significant ($P = 0.083$) and probably would have been so had 5 years of missing data been available. Possible causes of declines include banding, wet weather and effects on prey availability and nestling survival, nest site vulnerability to predators, or a shift in nesting distribution from the PSA to the Flats. All 5 successful Ferruginous Hawk nests in KRRSA 1997 and all 8 successful nests in 1998 were re-

occupied in 1999 but only 4 were successful. Attempts to determine band status of breeding adult raptors failed but one colorbanded Ferruginous Hawk was observed. Banding was limited to 6 Ferruginous Hawk nests in the Flats with 23 nestlings banded with USGS lock-on bands on the left leg and 22 with blue over silver colored, aluminum leg bands on the right leg. No falcons or eagles were banded. Mean frequency of 0.085 lagomorphs/km (n =2) were counted on surveys. Most lagomorphs were detected in survey sections with ≤ 25% cultivation adjacent to roads. Evidence of human activity within KRRSA has increased dramatically since 1988. Increased Ferruginous Hawk nesting success and exceptional productivity of falcons and eagles in 1999 may be indication of increasing prey numbers, development of nesting strategies to avoid humans, and a return to more mesic weather conditions. Recommendations are directed toward management of human activity, predators, and insects.

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INTRODUCTION

The Kevin Rim escarpment in northern Toole County, Montana, provides nesting habitat for a variety of raptors (Dubois 1988). The Bureau of Land Management (BLM) designated the Kevin Rim a ,ÄúKey Raptor Area,Äù and an ,ÄúArea of Critical Environmental Concern,Äù (Williams and Campbell 1988) to provide added habitat protection for raptors, especially sensitive and/or declining species. Ferruginous Hawks (*Buteo regalis*), Prairie Falcons (*Falco mexicanus*), and Golden Eagles (*Aquila chrysaetos*) are designated ,ÄúSpecies of Special Concern,Äù in Montana (Flath 1991) and are considered *key* species for investigation of aspects of population

dynamics in KRRSA.

Initial monitoring efforts in the vicinity of the Kevin Rim escarpment began in 1988 and several intensive studies since have focused on raptor productivity, habitat use, and aspects of population dynamics (Dubois 1988, Harmata 1991, VanHorn 1993, Zelenak 1996, Harmata and Zelenak 1996). Between 1995-1998, research efforts focused on primarily Ferruginous Hawk productivity and nestling banding but due to limited funds, complete reproductive statistics were not determined during that period. This report includes results of 1999 breeding surveys for key species as well as assessment of long-term occupancy rates and population trends of Ferruginous Hawks nesting in the vicinity of the Kevin Rim.

STUDY AREA

The Kevin Rim Raptor Study Area (KRRSA) is located approximately 32¬Ω km north to northwest of the town of Shelby, Toole County, Montana (Fig. 1). The KRRSA includes a Primary Study Area (PSA) that has been surveyed annually since 1988, Rattlesnake Coulee, and immediately adjacent table lands (Flats) to the north and

east of PSA (Fig. 1). Prior to 1997, coverage of the Flats was cursory but increased in 1997 through 1999. In 1999, the Flats were divided into NE and SE sections (Fig. 1). Rattlesnake Coulee was surveyed intermittently depending on time and funds, but not in all years. Buckley Coulee (north of Rattlesnake Coulee) was surveyed in 1990, 1994, and 1999. Buckley Coulee is currently not considered part of KRRSA proper but results of surveys there are included for regional perspective.

1999 OBJECTIVES

A. Determine location, occupancy, activity, and productivity of breeding areas of 3 key raptor species nesting in the Primary Study Area of KRRSA and Rattlesnake Coulee,

B. Determine colorband status of breeding adults of key species,

C. Band as many nestlings of key species as possible with USGS bands and colorbands, in the Flats only.

METHODS

Survey efforts were conducted during 3 phases consistent with

local raptor nesting phenology: early incubation phase (mid-Apr.), early nestling phase (early June), and late nestling phase (late June-July). During each phase, ~1 wk was spent surveying KRRSA and recording status of breeding areas for key species. The Flats and Buckley Coulee were not surveyed until the late-nestling period. All known nests were checked and an effort was made to search for new nests. Information gathered included: occupancy, activity, productivity, nest success, cause of failures, plumage of adults, and plumage of nestlings. Reproductive parameters used here (*e.g.* , occupied, active, breeding area) are consistent with definitions in MBEWG (1994). Nestlings of advanced age (>2/3 growth) were considered to have fledged.

Clutch sizes were not determined to avoid disturbance to incubating adults. Brood sizes were accurately recorded for most nests during the early-mid nestling period and again during the late nestling period (nestlings >5 wks). Nests were approached to <200 m only when absolutely necessary. Otherwise, optics were used to view nests from greater distances. Outside of the PSA, as many nestlings a possible were banded with USGS lock-on bands on the left leg and blue over silver

colored, aluminum leg bands on the right leg. Abandoned nests were inspected to determine cause, stage of nesting attempt, etc. Because nestling Ferruginous Hawks, Prairie Falcons, and Golden Eagles in the PSA have been banded with USGS bands since 1989 and colored leg bands since 1994, attempts were made to determine band status of adults by using a spotting scope from a distance of >400 m to minimize disturbance to breeding birds.

Long-term productivity of Ferruginous Hawks was evaluated by comparing occupancy, activity, and number of successful nests in PSA over the 12 years. Data for analysis were compiled from (Dubois 1988), Harmata (1991, 1998), VanHorn (1993), Zelenak (1995), and 1999 results. Additionally, breeding areas that have had melanistic breeders in multiple years may provide insight into nest site fidelity and re-occupancy rates so locations of dark-phase birds were recorded.

Banding activities were suspended within the PSA and Rattlesnake Coulee in 1999 in an attempt to assess whether banding activities over the past 8+ years were influencing declining nest success (Harmata 1998). However, in areas outside of the PSA (*e.g.* , Buckley

Coulee, Flats), banding continued.

Two headlight surveys for lagomorphs were conducted on 7 June and 28 July 1999 to evaluate prey availability in the vicinity of the PSA. Methods and routes were similar to those used by Harmata (1991), VanHorn (1993), and Zelenak (1996) to maintain consistency.

RESULTS

Occupancy, Productivity, and Nest Success

Ferruginous Hawks

Reproductive performance of Ferruginous Hawks in KRRSA in 1999 is summarized in Table 1. Distribution and productivity of Ferruginous Hawks in PSA and Rattlesnake Coulee are shown in Figure 1. Complete statistics were not available for Buckley Coulee because surveys were conducted only during the late nestling phase. Nestling mortality was low with only one nest known to fail post-hatching. All other nestlings observed during the early-nestling stage survived to >5 wks of age (*Appendix* Table 4).

Table 1. Reproductive performance of Ferruginous Hawks in the Kevin

Rim Raptor Study Area, 1999.

Nesting Area	Breeding Areas			Young/ Occupied Breeding Area	Nest Success
	Occupied	Active	Successful		
Primary Study Area	14	10	9	1.79	64.3%
Rattlesnake Coulee	4	1	1	0.75	25.0%
Flats	- a	- a	8	- a	- a

a Not determined.

Figure 2. Distribution and productivity of Ferruginous Hawk nests in the Primary Study Area and Rattlesnake Coulee, Kevin Rim Raptor Study Area, 1999.

Proportion of occupied Ferruginous Hawk breeding areas associated with the Kevin Rim escarpment (PSA & Rattlesnake Coulee) that produced ,â•1 young (*i.e* ., successful) was not different from those on the Flats (Fisher,Äôs Exact Test, $P = 0.52$). However, number of young produced per occupied breeding area was higher on the Flats than on the Kevin Rim escarpment (t 21 = 2.14, $P < 0.05$)(Table 2). Although success rate of Ferruginous Hawks breeding on private land (67%) in PSA was nearly twice that of those breeding on public land (BLM, Montana State) in PSA (37%; *Appendix* Table 4), difference was not significant (Fisher,Äôs Exact Test, $P = 0.54$). However, number of young produced per successful breeding area was higher for Ferruginous Hawks nesting on private land than on public land (t 8 =

3.14, P = 0.014). Success rate of 10 occupied nests in PSA and Rattlesnake Coulee that were subjectively classified as inaccessible to mammalian predators was 80%, higher than the 25% success rate of 8 nests classified as accessible (Fisher,Äôs Exact Test, P = 0.054).

Table 2. Brood size and productivity of Ferruginous Hawks nesting within the Kevin Rim Raptor Study Area and Buckley Coulee, 1999.

Nesting Area	Brood Size			Young Produced
	n	Mean	SD	
Primary Study Area	9	2.78	¬± 1.05	26
Rattlesnake Coulee	1	3.0	---	3
Buckley Coulee	5	3.2	¬± 1.48	16
Escarpment	15	3.0	¬± 1.13	45
Flats	8	4.0	¬± 0.93	32
Total	23	3.35	¬± 1.15	77

Long-term Productivity of Ferruginous Hawks

Number of successful nests in the PSA declined significantly over a decade of study (Fig. 3). If occupancy and fledging data were complete for the period (occupancy data are absent for 5 years), declines

evident in number of occupied nests and number of young produced in the PSA (Fig. 4) probably also would be significant ($P < 0.05$).

Figure 3. Decline in number of successful Ferruginous Hawk nests in

the Primary Study Area, Kevin Rim Raptor Study Area, 1988-1999.

Figure 4. Trend in number of occupied Ferruginous Hawk breeding areas and total young fledged in Primary Study Area, Kevin Rim Raptor

Study Area, 1988-1999

Re-occupancy of Ferruginous Hawk Breeding areas

Fifty per cent (n = 24) of Ferruginous Hawk breeding areas occupied in 1993 and 41.7% (n = 24) of breeding areas occupied in 1994 were re-occupied in 1999. All 5 successful Ferruginous Hawk nests in 1997 were also re-occupied in 1999 and all 8 successful nests in 1998 were re-occupied in 1999. However, only 50% (n = 8) of 1999 re-occupancies were successful.

Melanistic individuals have not been uncommon as breeders at KRRSA, usually comprising ,ãà15% of breeders. Zelenak (1996) reported 6 and 7 mixed-plumage pairs in 1993 and 1994, respectively. In 1999, 4 mixed-plumage pairs occupied breeding areas, 3 of which occupied sites that were occupied by melanistic individuals in 1994. Three sites with melanistic individuals in 1998 were all occupied by melanistic individuals again in 1999. A breeding pair of Ferruginous Hawks with both members in melanistic plumage has not been observed at the KRRSA.

Prairie Falcons and Golden Eagles

Distribution and production of Prairie Falcon eyries and Golden Eagle nests in PSA and Rattlesnake Coulee are shown in Figure 5 and reproductive performance summarized in Table 3. Although precise location of one Prairie Falcon eyrie in PSA was unknown, it was presumed successful (,â•1 fledged) based on defensive and vocal behavior of adult falcons during the late-nestling stage. In Buckley Coulee, one Prairie Falcon eyrie (location P12, *Appendix* Table 5) also was presumed successful from the presence of territorial and defensive adults. All Golden Eagle pairs known to reside in PSA and Rattlesnake Coulee were productive (*Appendix* Table 5). Cliffs are absent in the Flats and thus devoid of obligate cliff-nesting falcons. No Golden Eagles were found nesting in the Flats in 1999.

Table 3. Prairie Falcon and Golden Eagle reproductive performance in the Kevin Rim Raptor Study Area, 1999.

	Nesting Area	Occupied	Active	Productive	Fledged	per Occupied Breeding Area
Prairie Falcon	Primary Study Area	8	7	7	,â•17	,â•2.13
	Rattlesnake Coulee	3	3	2 b	,â•4	,â•1.33
	Buckley Coulee	1	unk.	unk.	unk.	unk.
	Total	12	,â•10	,â•9	,â•21	,â•1.75
Golden Eagle	Primary Study Area	2	2	2	2	1.0
	Rattlesnake Coulee	1	1	1	1	1.0
	Buckley Coulee	1	1	1	1	1.0
	Total	4	4	4	4	1.0

b one eyrie unknown activity.

Recruitment

Efforts to assess the band status of breeding raptors in PSA were largely ineffective. Approach of breeding adults to proximity adequate to determine band status without affecting their behaviour and inducing significant disturbance was not possible throughout most of the KRRSA. Typically, adults would flush from perches while observers

were still >200 m away and begin soaring. Adults could be viewed more closely while defending the nest during nest visits but verifying whether one or both were banded was still not possible. In the Flats, many Ferruginous Hawk nests were located near roads and a few adults could be inspected from the vehicle while they perched on nearby utility poles. None were banded.

One color-banded Ferruginous Hawk, not obviously associated with a breeding area, was observed near the southern boundary of the PSA. The hawk was perched on a fence post near the road and the colorband was on the right leg, indicating it was banded in 1997 or 1998 as a nestling. The hawk flew before colorband configuration and plumage could be accurately determined. Light-colored leg feathers suggested the bird <1 yr old.

Banding

In 1999, 23 Ferruginous Hawk nestlings were banded with USGS bands on the left leg and all but one nestling was colorbanded on the right leg. Eight nestlings, distributed evenly between 2 nests, were not banded due to their advanced age. Banding activity was limited to 6

Ferruginous Hawk nests in the Flats. No Prairie Falcons or Golden Eagles were banded in 1999.

Prey Availability

Five lagomorphs were observed along 40.1 km of secondary roads (0.12 lagomorphs/km) during the first lagomorph headlight survey and 1 cottontail (*Sylvalagus* spp.) and 1 white-tailed jackrabbit (*Lepus californicus*) along 37.3 km (0.05 lagomorphs/km) on the second survey. Mean frequency for surveys was 0.085 lagomorphs/km. Three (43%) of 7 lagomorphs were detected along survey sections with 0% cultivation (*i.e.* , all native vegetation) adjacent to roads. Four (57%) were detected in survey sections with $\leq$ 25% cultivation adjacent to roads and none were detected in sections with >25% cultivation adjacent to roads.

Human Activity on and near the Kevin Rim

Evidence of human activity within the study area has increased dramatically since 1988. Truck and ATV tracks were prevalent throughout the grasslands on top of the Rim in 1998 and 1999 whereas

virtually none were evident during field work up to 1997. Some were most likely from local ranchers but many others appeared to be without function or direction and more representative of recreation. Two groups of people were hiking to the Rim in late April and June 1999 and would have passed directly below active Ferruginous Hawk nests if not alerted by field personnel. These were the first wreckreationists encountered in 10 years of field work at Kevin Rim. The dam has broken and the inundation follows.

DISCUSSION

Ferruginous Hawk Breeding Area Occupancy and Success

Occupancy of Ferruginous Hawk breeding areas in PSA continues to decline (Fig. 4). Regression is nearly significant ($P = 0.083$) with 5 years of missing data. A possible cause that cannot be dismissed is the nearly annual disturbance induced by nestling banding activities. Ferruginous Hawks are notoriously sensitive to human activity (Fyfe and Olendorf 1977). Effects of disturbance on breeding adult hawks induced by entering nests to band young may be surpassed only by that of a predator removing the young. Constant banding disturbance may

have induced breeding pairs to abandon territories or just not breed. Cessation of nestling banding in the PSA, coincident initiation of banding in the Flats (where few young have been banded previously), in concert with continued productivity monitoring throughout KRRSA, may help determine the impact of nestling banding on Ferruginous Hawk occupancy of breeding areas and reproduction.

Other possible influences on declining occupancy and productivy include weather and effects on prey availability and nestling survival, nest site vulnerability to mammalian predators, or a shift in nesting distribution from the PSA to the Flats. VanHorn (1993) and Zelenak (1996) both reported weather, specifically cold temperatures, rain, and hail showers, as significant causes of nest failure during incubation and early nestling phase (late Apr.-mid. June). Zelenak (1996) found that spring mosture increased in the Kevin Rim Area from 1988 to 1995 and 1997 was the wettest spring/early summer since 1988. Exceptionally wet early spring in 1997 resulted in explosive vegetative growth and mosquito (*Anopheles, Culex* spp.) production in plague proportions. Grasses and forbs reached heights and cover density not seen in PSA in

9 previous years of study. Banders and nestlings were infested with mosquitos. Nest success was lowest ever recorded in PSA in 1997 (Fig. 4).

There is a brief period (,â§1 wk) when nestlings are only partially feathered and adult brooding behaviour wanes. Nestlings are susceptible to hypothermia if down becomes saturated during heavy or prolonged rain and survivability may be affected. Low success was most likely also influenced by reduced availablity of Richardson,Äôs ground squirrels (*Spermophilus richardsonii*) because they probably were shielded by long grass. Effects of lack of food was possibly exacerbated by reduced fitness of nestlings induced by excessive blood loss and harassment from insects in 1997. Conversely, 1998 had a fairly dry spring/early summer and 1999 was nearly drought conditions until late June. Both 1998 and 1999 experienced much higher productivity than 1997.

Lagomorph populations have declined dramatically in the Kevin area over the past several decades, according to a local rancher (M. Simms; pers. comm). She reported that ,Äúgangs,Äù of jackrabbits were seen commonly in the region, resembling herds of sheep. Dubois

(1988) described jackrabbits as abundant in the Kevin Rim area during 1988, whereas a paucity of rabbits was noted from 1995-1998 (Harmata 1998). Headlight-surveys conducted in the PSA since 1990 showed the frequency has declined steadily from 0.56/km in 1990, to 0.19/km and 0.09/km in 1991 and 1992, respectively (VanHorn 1993), to 0.06/km in 1994 (Zelenak 1996). A slight increase was evident in 1999. Also, jackrabbits and desert cottontails seemed more obvious during daytime field work in 1999 along with the abundance of cottontail sign, especially on the Rim. Number of road-killed jackrabbits on area highways appeared to increase over previous 5 years also. Jackrabbits populations are known to cycle in many areas (*e.g* ., Johnson and Peek 1984) and perceived increase is probably representative of an overall jackrabbit population increase. Additionally, ground squirrels subjectively were more abundant in 1999. Future monitoring should include lagomorph populations to help confirm the prey/productivity relationship.

In 1999, occupied Ferruginous Hawk nests that were subjectively classified as inaccessible to mammalian nest predators were more

successful than accessible nests. Many populations of generalist predators (*e.g.* , canids) are expanding and currently are at extremely high densities (D.Flath, Montana Fish, Wildlife & Parks, pers. comm). Over the past 12 years of this study, frequency of ground nesting by Ferruginous Hawks has declined (there is a plethora of old and unused ground nests within the KRRSA) and ground nests rarely were successful.

Declining occupancy of Ferruginous Hawk breeding areas in PSA and vicinity may be explained by hawks avoiding increasing wreckreational disturbance on the Rim by shifting breeding activities farther east to the Flats. Oil exploration and exploitation in the Kevin-Sunburst-Oilmont Area have declined throughout the decade (Zelenak 1996) and associated activity has decreased on the Flats where elevated structures (trees) are more plentiful. Such a shift does not easily explain declining productivity of existing pairs in PSA. On the Flats, overhead canopy of trees may mitigate depressing influence of weather on productivity that is manifest on the Rim or, the more productive pairs abandoned sites in the PSA and were replaced by less productive pairs

on the Rim. Unfortunately, no data on numbers, distribution, or productivity of Ferruginous Hawks nesting in the Flats exist prior to 1998. Existence of such a shift and causes are merely speculative and indicate the need for landscape rather than locally oriented monitoring of populations.

If low and declining nest success is real, existing levels may not provide enough production to offset mortality during migration or in wintering areas (Schmutz and Fyfe 1987), thus reducing number of recruits available to fill vacant breeding areas, resulting in a cascade effect. However, 2 consecutive years of increased nest success suggests a possible upswing productivity. A decade of declining productivity may thus have been a component of a normal, long-term cyclic pattern. Thus the value of long-term monitoring of Ferruginous Hawk populations.

VanHorn (1993) and Zelenak (1996) examined re-occupancy rates but neither included > 2 breeding seasons. Both found relatively high (60-80%) re-occupancy rates for successful and unsuccessful nests alike. Rates for 1999 were more modest (40%-50%). Although the same breeding areas are often re-occupied for several years by similar-

appearing birds, it remains largely unknown if Ferruginous Hawks exhibit high nest site fidelity.

Prairie Falcon and Golden Eagle Breeding Area Occupancy and Success

All Prairie Falcon and Golden Eagle breeding areas in the KRRSA were occupied in 1999. Most, if not all falcon pairs were active with nearly 90% productive. Despite recent reported declines in Golden Eagles elsewhere (Kirk and Hyslop 1998), all Golden Eagle breeding areas were productive, a success never before noted in KRRSA. Productivity of 1.0 per occupied breeding area was well above values recently noted in other stable populations of Golden Eagles in the west (*e.g* ., 0.46, Hunt 1994, Harmata 1999). As obligate cliff nesters using mostly inaccessible holes, effects of human activity on nesting Prairie Falcons may be least of the 3 key species nesting at KRRSA. Golden Eagles, although susceptible and sensitive to human activity, are increasingly nesting in more inconspicuous sites since 1988, possibly minimizing exposure to humans. With nesting strategies that mitigate effects of human activity, increased productivity of falcons and eagles in

KRRSA in 1999 may be further indication of increasing prey numbers and a return to more mesic weather conditions.

MANAGEMENT RECOMMENDATIONS

The most significant depressor of raptor populations in KRRSA is probably weather, which obviously cannot be managed. However, some conditions that exacerbate weather effects can be managed; most notably human activity, followed by predators and insects. To these ends we recommend the following:

1. Install a combintation lock on gate at southwest corner of PSA to control access to entire South Rim area between mid-March and July.

2. Prohibit vehicles (especially ATVs) except of local residents from PSA. Failing that, fence along top of rim to exclude vehicular access to within 100 meters of the edge of rim, especially the South Rim.

3. Move current signs to better protect the most productive sections of

the Rim but low enough on the access road so not to divulge the actual cliff sections.

4. Reword sign on access road. Current verbiage suggests land from readers side of the sign is closed and land from sign to Rim is ***open*** !

5. Purchase more land, encourage conservation easements (*e.g.* , Butch Gillespie, Simms Ranches) etc., to better control the land for long-term protection of nesting ***and*** foraging habitat below the rim, Rattlesnake and Buckley Coulees.

6. Discourage conversion of land no longer in oil production to agriculture.

7. Continue ongoing research for continuing to monitor all major breeding parameters, including occupancy, productivity, nest success, nestling mortality, and recruitment, including the Flats.

8. Identify pairs of Ferruginous Hawks with low history of success and evaluate for improvement with nest platforms or predator barriers, including some on the escarpment.

9. Construct and place more nesting platforms for Ferruginous Hawks in areas of no historical occupancy.

10. Dust affected Prairie Falcon, Ferruginous Hawk, and Golden Eagle eyries with Sevin,Ñ¢ to control *Ornithodorus aquilae* (avian tick).

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APPENDIX

Appendix Table 4. Nest codes, nest location, description of adults, and productivity and success for occupied Ferruginous Hawk breeding areas during 1999 survey of Kevin Rim Raptor Study Area.

New Territory #	Nesting District	Land Ownership	Adult Plumage Light or Mixed	Egg ?s	Nestlings?	Nestlings >4 wks	Fledgling Color
F1	Int. V	Private	L	Y	Y	5	5L
F2	Int. V	MT State	L	Y	N		
F3	Int. V.	MT State	L	N			
F4	S. Rim	Private	L	Y	Y	3	3L
F5	S. Rim	BLM	L	Y	Y	≥ 1	1L
F6	S. Rim	BLM	L	Y	Y	Failed	
F7	S. Rim	BLM	L	N			
F8	S. Rim	MT State	M	Y	Y	3	3D
F9	S. Rim	BLM	L	Y	Y	2	2L

F10	N. Rim	Private	----	----			
F11	N. Rim	BLM	L	N			
F12	Rattl. C.	Private	L	N			
F13	Rattl. C.	Private	M	Y	Y(?)	Failed (?)	
F14	Rattl. C.	Private	----	----			
F15	Rattl. C.	MT State	L	Y		Failed	
F16	Rattl. C.	Private	M	Y	Y	3	1L, 1D, 1unk
F17	Badlands	Private	L	Y	Y	4	4L
F18	Badlands	BLM	M	Y	Y	2 (< 4 wk)	2 unk
F19	Badlands	MT State	L	Y	Y	2	2L
F20	Badlands	Private	L	Y	Y	≥ 3	3L
F21	N. Flats	Private	L	Y	Y	4	4L
F22	N. Flats	Private	M	Y	Y	4	2L, 2D
F23	SE Flats	Private	M	Y	Y	4	4D
F24	SE Flats	Private	L	Y	Y	5	5L
F25	SE Flats	Private	L	Y	Y	5	5L
F26	SE Flats	Private	L	Y	Y	4	4L
F27	SE Flats	Private	L	Y	Y	4	4L
F28	SE Flats	Private	L	Y	Y	≥ 1	1L
F29	Buckl. C.	Private	L	Y	Y	5	5L
F30	Buckl. C.	Private	L	Y	Y	4	4L
F31	Buckl. C.	Private	Unk	Y	Y	≥ 3	3L
F32	Buckl. C.	Private	Unk	Y	Y	3	3L
F33	Buckl. C.	Private	L	Y	Y	1	1L

Appendix Table 5. Location and productivity (nestlings >4 wks old) for Prairie Falcon (PRFA) and Golden Eagle (GOEA) breeding areas located within the Kevin Rim Raptor Study Area, 1999.

Species	Breeding Area #	Nesting District	Activity		Productivity
			Eggs	Nestlings	
PRFA	P1	S. Rim	Y	Y	≥1
PRFA	P2	S. Rim	Y	Y	≥2
PRFA	P3	S. Rim	Unk	N	
PRFA	P4	S. Rim	Y	Y	4
PRFA	P5	S. Rim	Y	Y	≥3
PRFA	P6	S. Rim	Y	Y	≥2
PRFA	P7	S. Rim	Y	Y	4
PRFA	P8	N. Rim	Y	Y	≥1
PRFA	P9	Rattl. C.	Y	Unk	Unk
PRFA	P10	Rattl. C.	Y	Y	≥1
PRFA	P11	Rattl. C.	Y	Y	≥3
PRFA	P12	Buckl. C.	Y	Unk	Unk
GOEA	G1	S. Rim	Y	Y	1
GOEA	G2	N. Rim	Y	Y	1
GOEA	G3	Rattl. C.	Y	Y	1

GOEA	G4	Buckl. C.	Y	Y	1

Appendix Table 5. Location and productivity (nestlings >4 wks old) for Prairie Falcon (PRFA) and Golden Eagle (GOEA) breeding areas located within the Kevin Rim Raptor Study Area, 1990.

Species	Breeding Area ID	Nesting Cliff(s)	Active	Successful	Young Fledged
PRFA	P1	S. Bend	Y	Y	2
PRFA	P2	E. Rim	Y	Y	2
PRFA	P3	S. Rim	Unk	N	0
PRFA	P4	S. Rim	Y	Y	2
PRFA	P5	S. Rim	Y	Y	2
PRFA	P6	S. Rim	Y	Y	2
PRFA	P7	S. Rim	Y	Y	3
PRFA	P8	W. Rim	Y	Y	2
PRFA	P9	Rand. C.	Y	Unk	Unk
PRFA	P10	Rand. C.	Y	Y	3
PRFA	P11	Rand. C.	Y	Y	2
PRFA	P12	Rand. C.	Y	Unk	Unk
GOEA	G1	S. Rim	Y	Y	1
GOEA	G2	N. Rim	Y	Y	1
GOEA	G3	Rand. C.	Y	Y	1